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IONOSPHERE INVESTIGATION ON THE SCHOONER "ZARYA" (1960 - 1961)

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IONOSPHERE INVESTIGATION ON THE SCHOONER "ZARYA"

(Issledovaniya ionosfery na shkhyne "Zarya")

(1960-1961)

Geophysical Bulletin No. 11
Academy of Sciences of the USSR
Soviet Geophysical Committee,
Moscow, 1962

by L. P. Goncharov

The non-magnetic schooner "Zarya" conducted the mapping of the magnetic field over the waters of the Pacific Ocean during the 1960 — 1961 period. Simultaneously with that, the registration of the nucleon component of cosmic rays and a vertical sounding of the ionosphere were made.

"Zarya" sailed from Vladivostok on 5 October 1960 and returned on 29 April 1961. During that seven-month period, the ship covered over 25 000 miles, calling at Hong Kong, Darwin, Sydney, Wellington, Valparaiso, Easter island, and also the Marquises (see fig. 1).

Generally "Zarya" sailed under heavy storm conditions. Particularly difficult was the trajectory sector between Wellington and Valparaiso, extending over 5000 miles along the famous "roaring forties" latitudes. In spite of this, the crew of "Zarya" could fully complete the assigned working schedule.

During stops at ports of call, the crew could visit the scientific institutions and get acquainted with local inhabitants.

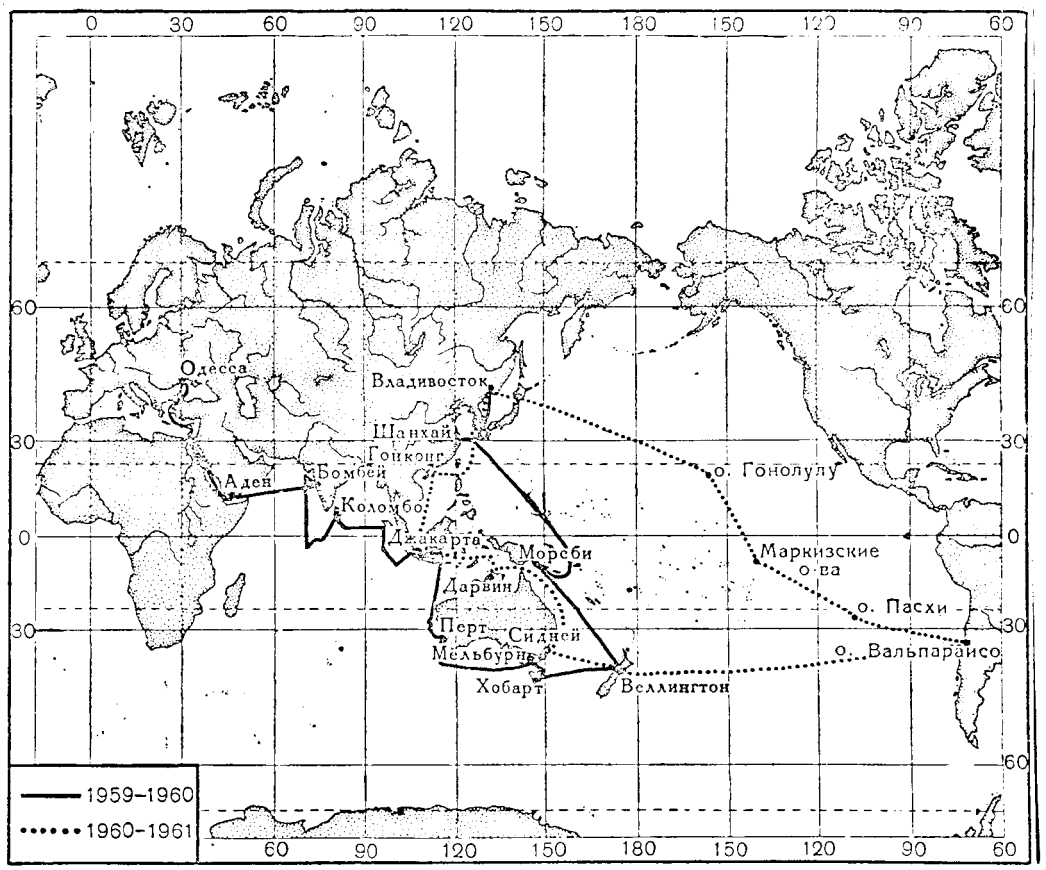

Fig.1. Course of the scientific research schooner "Zarya" during her 1959-1960 and 1960-1961 sailings

In Hong Kong, the members of the expedition got acquainted with the operation of the meteorological observatory, in Sydney and Wellington — with scientific work and equipment of physical faculties of universities. Visited also wer the geophysical laboratories.

The schooner received a great number of visitors-specialists geophysicists, who visited the ship with great interest and got acquainted with its scientific equipment. Animated exchange of information took then place around questions of common interest.

A AIS-type ionosonde was in operation aboard "Zarya" during the current as well as previous expedition. In spite of heavy seas, high temperatures (to 100° F) and a high humidity of the air in the

laboratory, the ionosonde operated smoothly and reliably.

The program of ionosphere investigations uncluded the obtention of ionsophere's high-frequency characteristics, and the composition of f – graphs and tables for hourly values of critical frequencies. As a result of the work carried out, a great number of interesting and diversified ionograms was obtained, well characterising the state of the ionosphere along the path of the ship. Plotted are in Fig. 1 f - graphs showing how much the daily course of critical frequencies of the F_2 - layer can vary at quiet state of the ionosphere in the region of the South China Sea. Thus, on the graph for November 3rd 1960 (Fig. 1a), the daily course of critical frequencies of the F_2 – layer has a deep minimum in morning hours. Then the critical frequencies rise brutally during two hours – from 3 to 14 mc/s, and after the noon hour – decrease slowly. A scattering, typical of tropical zones, is observed in the F_2-layer as of 20 00 hours local time.

Plotted is in Fig. 1, б the f - graph for 25 November 1960. The course of critical frequencies of the F_2 - layer has in it a sharply outlined maximum in afternoon hours.

All the three f-graphs present a mildly expressed daily course of critical frequencies of the F_1 – layer.

During the sailing one period was noted – from 10 to 17 November 1960, when the ionosphere was most disturbed. It is well known from certain works [2] that this period was characterized at high latitudes by strong magneto-ionospheric disturbances of corpuscular origin. But at lower latitudes, the effect of such disturbances in the ionosphere, caused by corpuscular streams, are expressed much more weakly, and to the contrary, the sudden ionospheric disturbances caused by ultraviolet radiation of chromospheric flares on the Sun are here well revealed.

Plotted is in Fig. 1 г, the f – graph for 15 Nov. 1960, showing a sudden total absorption against the background of a quiet state of the ionosphere. The absorption began after a large

flare on the Sun at 02 00 hours U.T. and it constitutes a typical "Delinger effect".

At present a detailed processing of all observation materials obtained during the sailing is under way.

**** E N D ****

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2. W. S. CAMBELL and P. L. HUBERT. The ionospheric disturbance of November 12 and 16, 1960. Canad.J. PHYSICS, v.39, N 4, 1961

Translated by ANDRE L. BRICHANT

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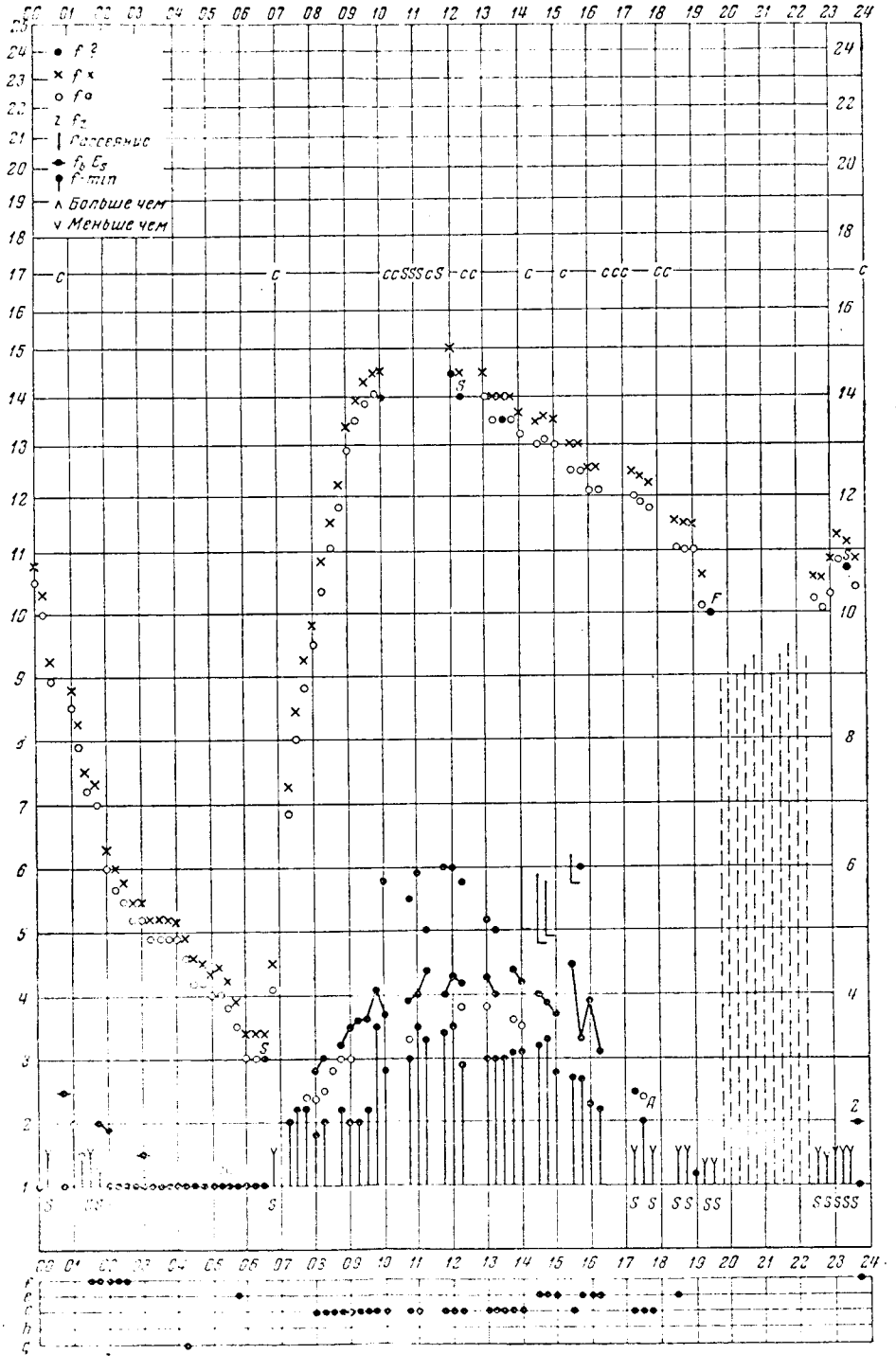
July First, 1962

scattering

more then
less than



а

Рис. 1. *f*-графики ионосферных данных:
а — за 3 ноября 1960 г.;

Fig.1.- f-graphs of ionospheric data
a — for 3 November 1960

scattering

more than
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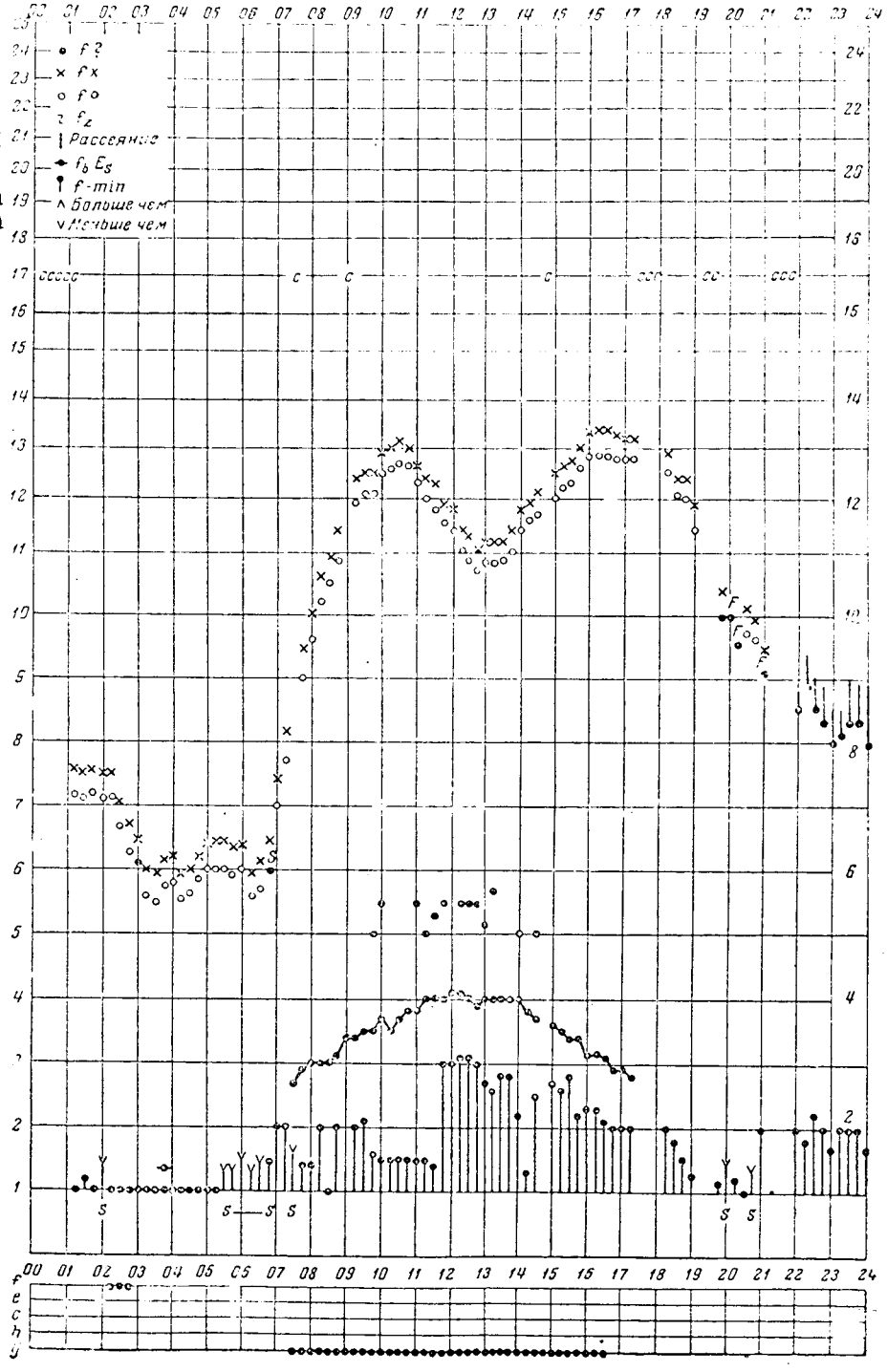

б

Рис. 1 (продолжение) (cont'd)
б — за 5 ноября 1960 г.; for 5 Nov. 1960

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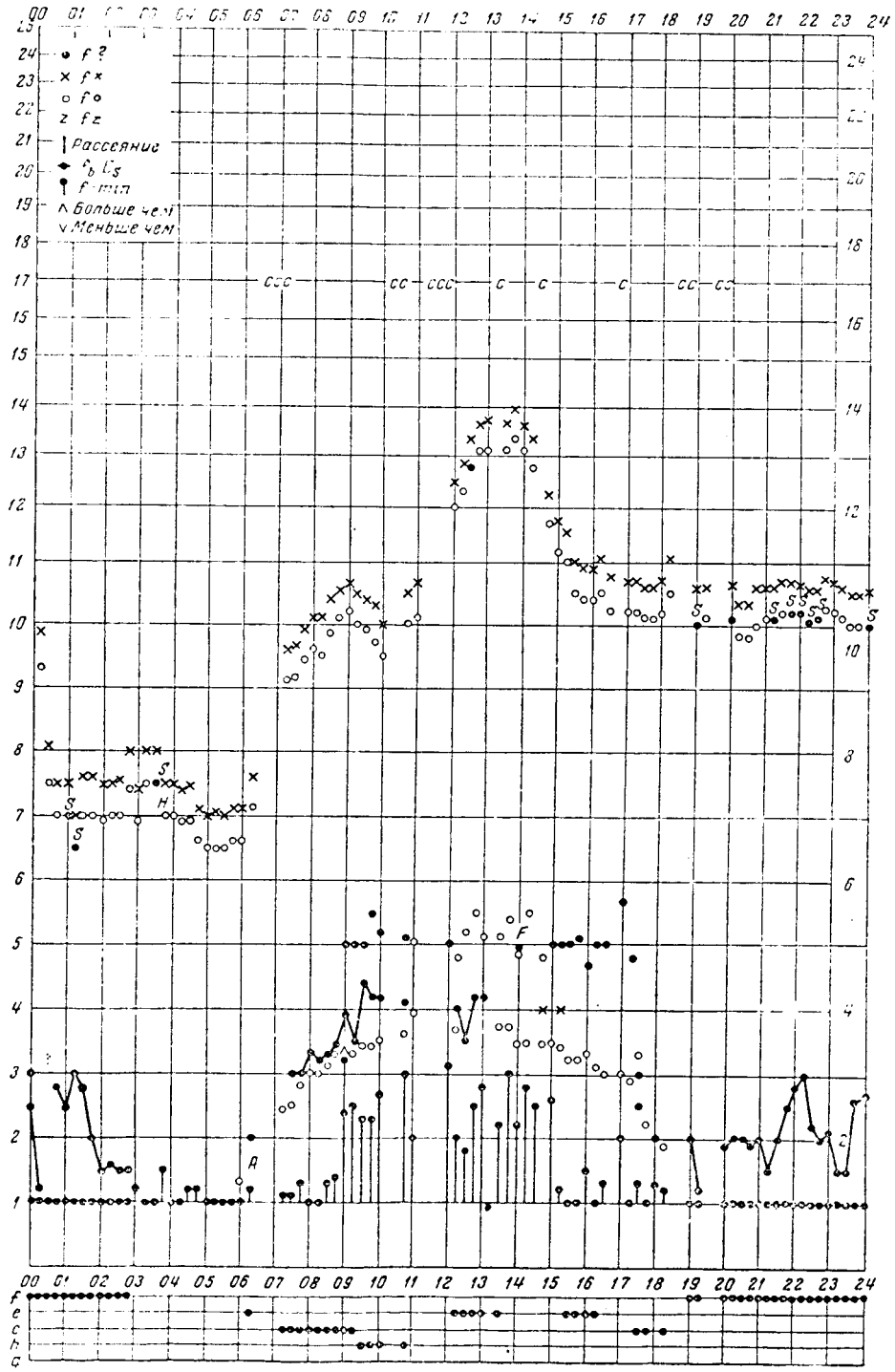

в

Рис. 1 (продолжение) (cont'd)
в — за 25 ноября 1960 г.: for 25 Nov. 1960

scattering

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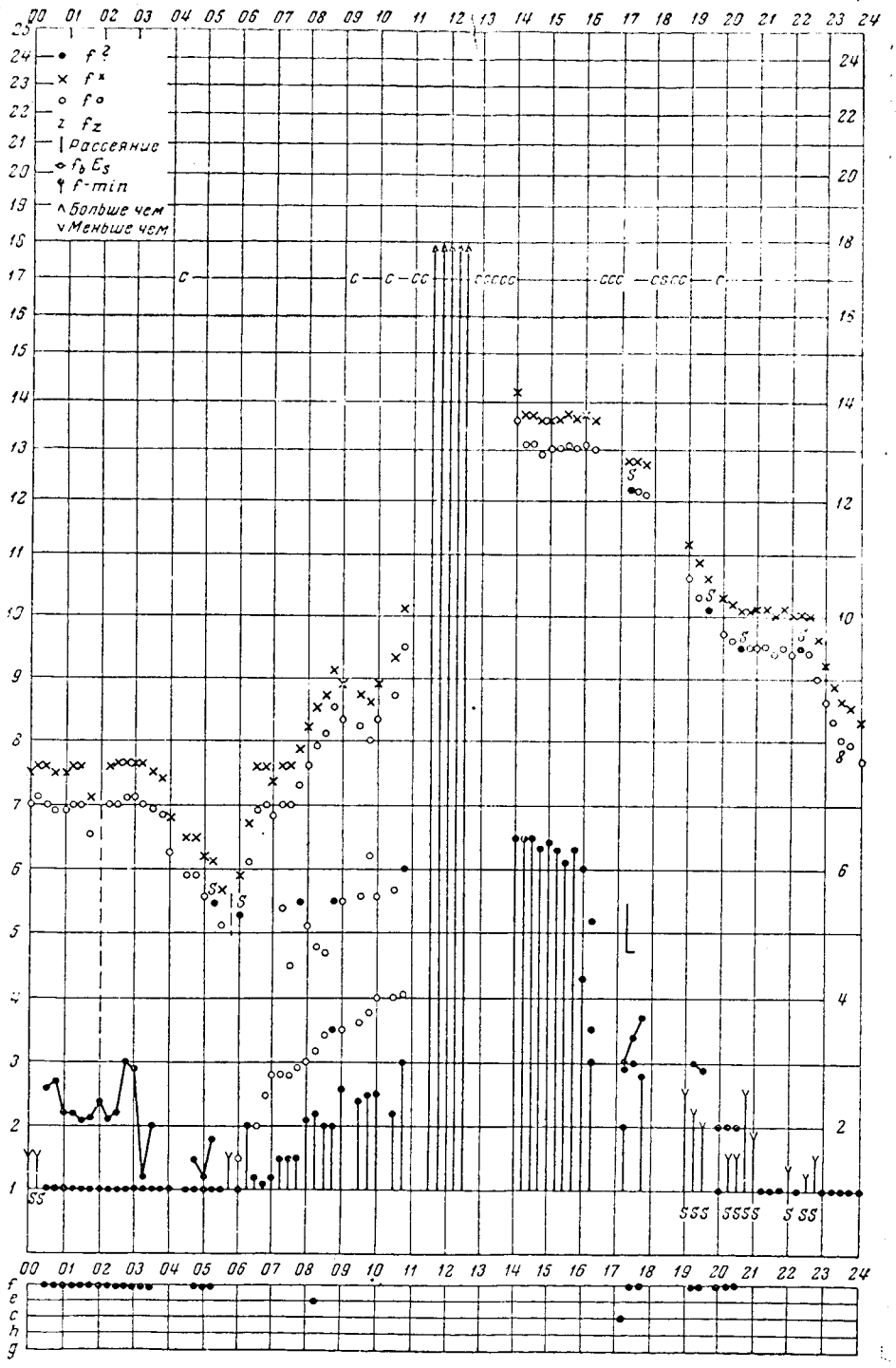

г

Рис. 1 (окончание) (end)
г — за 15 ноября 1960 г. for 15 November 1960